TUBA
Stentoro-Phonica,

An *INSTRUMENT* of E[illegible] USE,
As well at SEA, as at LAND;
Invented and *variously Experimented* in the Year 1670.

AND

HUMBLY PRESENTED
TO THE
KINGS Most Excellent MAJESTY
CHARLES II.
In the Year, 1671.

By *S. MORLAND.*

The INSTRUMENTS (or SPEAKING TRUMPETS) of all Sizes and Dimensions, are Made and Sold by Mr. [illegible] one of His Majesties Trumpets in *Suffolk-street.*

LONDON,
Printed by *W. Godbid*, and are to be Sold by *M. Pitt*
at the *White-Hart* in *Little-Britain.* 1671.

P. Lilly Pinxit
P. Lombart Sculpsit
SAMVEL MORLANDUS
CAMERÆ PRIVATÆ
Eques Auratus, & Baronettus; nec non
Generosus

Fff. 6

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Printed by W. Godbid, and are to be Sold by M. Pitt
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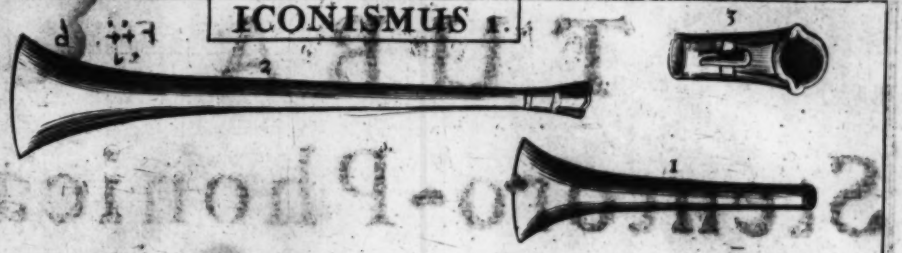
A



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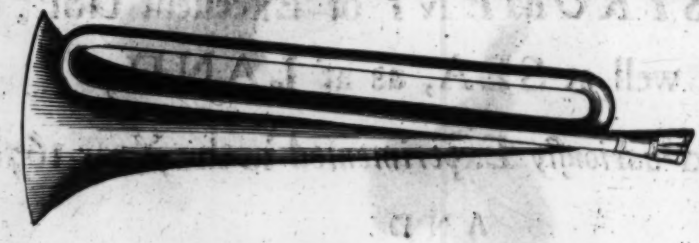

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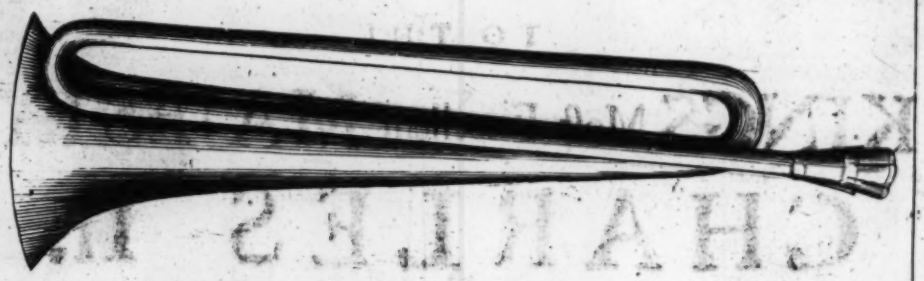


D

E

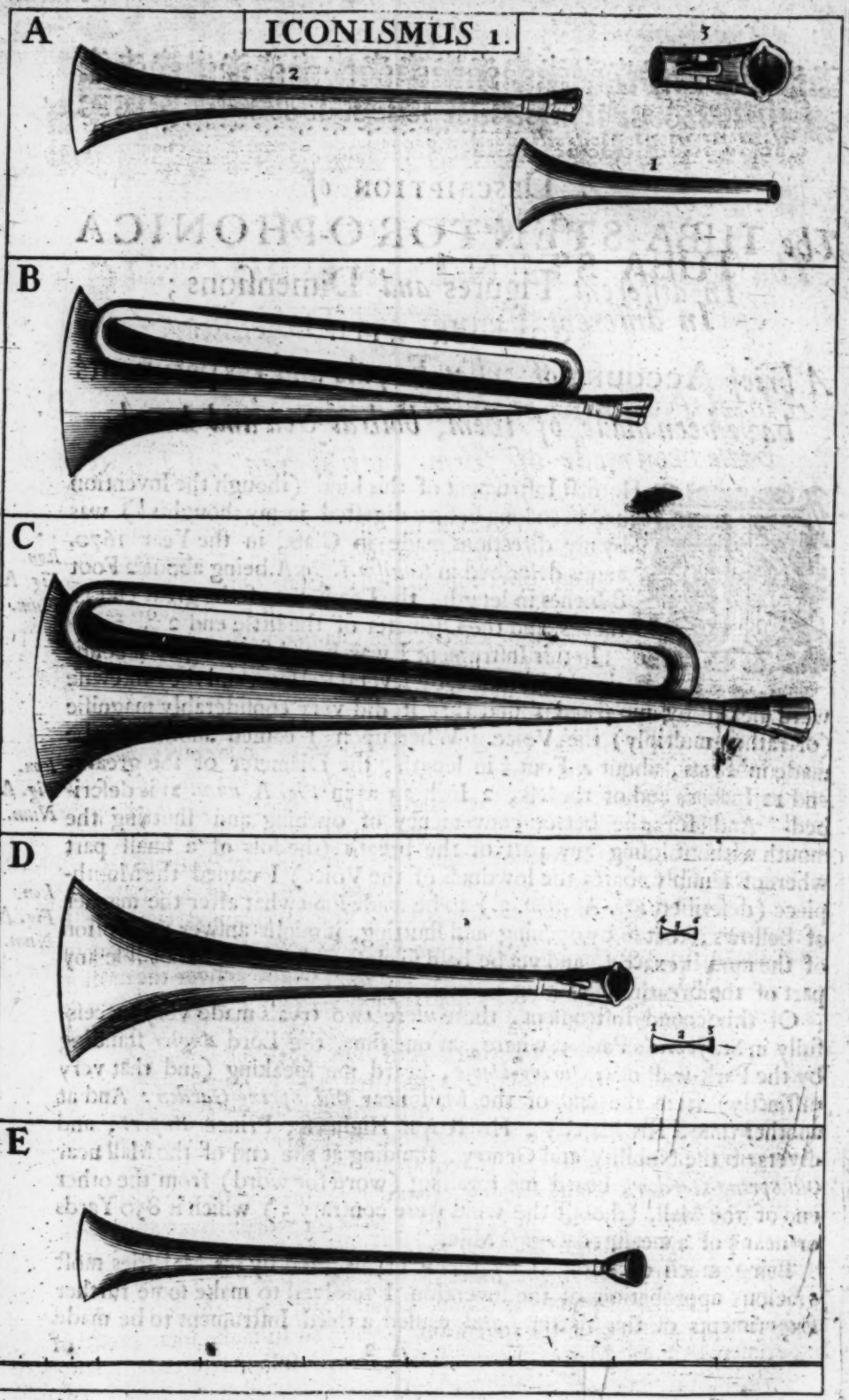
A DESCRIPTION *of*
The TUBA STENTORO-PHONICA
In different Figures *and* Dimenſions;
TOGETHER WITH
A brief ACCOUNT *of what* Tryals *and* Experiments *have been made of them, both at Sea and Land.*

THe firſt Inſtrument of this kind (though the Invention had been long before digeſted in my thoughts!) was by my directions made in Glaſs, in the Year 1670. and is deſcribed in *Iconiſm.* 1. *Fig.* A. being about 2 Foot 8 Inches in length, the Diameter of the great end 11 Inches, and the Diameter of the little end 2 $\frac{1}{2}$. *Icon.* 1. *Fig.* A. *Num.* 1.

In this Inſtrument I was heard ſpeaking at a conſiderable diſtance, by ſeveral Perſons, and they likewiſe were heard by me, and found that it did very conſiderably magnifie (or rather multiply) the Voice. Whereupon I cauſed another to be made in Braſs, about 4 Foot $\frac{1}{2}$ in length, the Diameter of the greater end 12 Inches, and of the leſs, 2 Inches; as in *Fig.* A. *num.* 2. is deſcribed. And for the better conveniency of opening and ſhutting the mouth without loſing any part of the breath (the loſs of a ſmall part whereof ſenſibly abates the lowdneſs of the Voice) I cauſed the Mouth-piece (deſcribed *Fig.* A. *num.* 3.) to be made ſomewhat after the manner of Bellows, that ſo by opening and ſhutting, it might anſwer the motion of the mouth exactly, and yet be held ſo cloſe, that it might not loſe any part of the breath in ſpeaking. *Icon.* 1. *Fig.* A. *Num.* 2. *Icon.* 1. *Fig.* A. *Num.* 3.

Of this ſecond Inſtrument, there were two tryals made very ſucceſsfully in St. *James*'s Park; where, at one time, the Lord *Angier* ſtanding by the Park-wall near *Goring-Houſe*, heard me ſpeaking (and that very diſtinctly) from the end of the Mall near *Old Spring-Garden*: And at another time, His Majeſty, His Royal Highneſs, Prince *Rupert*, and divers of the Nobility and Gentry, ſtanding at the end of the Mall near *Old Spring-Garden*, heard me ſpeaking (word for word) from the other end of the Mall, (though the wind were contrary;) which is 850 Yards or near $\frac{1}{2}$ of a meaſured *Engliſh* Mile.

Being much encouraged by theſe Tryals, and by his Majeſties moſt gracious approbation of the Invention, I reſolved to make ſome further Experiments of this Matter, and cauſed a third Inſtrument to be made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ICONISMUS 1.
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of Copper, in the form of an ordinary Trumpet, (as is deſcribed in *Fig.* B.) the length 16 Foot 8 Inches, the Diameter of the great end 19 Inches, and of the little end 2 Inches. *Icon.* 1. *Fig.* B.

This Inſtrument I carried down below the Bridge (being accompanied with a Gentleman or two of my acquaintance) as far as a place called *Cuckolds-point*, and leaving it there in the hands of a Waterman, we Rowed down very near *Deptford*; and there, notwithſtanding the noiſe of Seamen and Carpenters in divers Ships both before and behind us, we heard very diſtinctly moſt words the ſaid Waterman ſpoke in it, whom we judged to be at leaſt a Mile and an half diſtant from us, and concluded that had the River been free from noiſe, we might have heard and underſtood much further.

After that, I cauſed to be made a fourth Inſtrument of Copper (as is deſcribed *Fig.* C.) about 21 Feet in length, the Diameter of the great end 2 Foot, and of the little end 2 $\frac{1}{4}$; and of the ſame Figure and Shape with the former, only it was more exactly wrought. *Icon.* 1. *Fig.* C.

I gave likewiſe directions at the ſame time (for variety ſake) for a fifth Inſtrument of Copper, the length whereof was 5 Foot 6 Inches, the Diameter of the great end 21 Inches, and of the little end 2 Inches, as in *Fig.* D. As likewiſe for two ſmaller Inſtruments, whoſe length was each 5 Foot 6 Inches, the Diameter of the great end 10 Inches $\frac{1}{2}$, and of the little end 1 Inch $\frac{1}{4}$. *Icon.* 1. *Fig.* D. *Icon.* 1. *Fig.* E.

The third and fourth of theſe Inſtruments were, at one Tryal, heard from off the River over againſt *Faux-Hall*, to the neareſt part of *Batterſey* over againſt *Chelſey*: And at another from *Hide-Park-Gate* to *Chelſey-Colledge*; either of which diſtances was judged to be above a Mile and an half. And by what Tryals I have made of the two leaſt of all, I conceive they may maintain a conference, in a ſtill calm evening, at the leſt three quarters of a meaſured Mile.

After this, by His Majeſties ſpecial Command, the three largeſt of theſe Inſtruments were ſent to *Deal* Caſtle, and there ſeveral Tryals were made of them by the Honourable *Francis Digby* Eſq; Governour of that Caſtle; a particular Relation whereof was given under his own hand to the Right Honourable the Lord *Arlington*, His Majeſties Principal Secretary of State, in a Letter bearing Date the 14*th* of *October*, 1671. A Copy whereof His Lordſhip gave me leave here to inſert.

The Copy of a Letter written to the Lord *Arlington*, His Majesties Principal Secretary of State, by the Honourable *Francis Digby* Esq; Governour of *Deal* Castle, bearing Date, *October* 14. 1671.

MY LORD,

SIr Samuel Morland *having by the Kings Order sent hither three of his new Speaking-Trumpets, I have found them, upon several Tryals to answer, if not exceed what could be expected from them; which I thought necessary to let your Lordship know, as the best way of satisfying His Majesty concerning them. The first Experiment I made, was between* Waumer *Castle and* Deal *Castle, with the disadvantage of a side Wind and some noise of the Sea, and yet we heard very distinctly from Castle to Castle, which are about a measured Mile asunder. Since that I have tryed the biggest of the three, which is turned Trumpet-wise, and when the Wind blows from the Shore, we hear plainly off at Sea as far as the Kings Ships usually ride, which is between two and three Miles. This we have done several times, but particularly some days since, we heard from the Castle, to Sir* John Chichley's *Ship, which lay in the best of the Road. So that without question, they will be of great use in all occasions where it's necessary to give Orders or Intelligence at a distance; but most of all at Sea, where we can give and take the advantage of the Wind, as is best for hearing. We have found likewise, that by laying one of these Instruments to the Ear, the Words are heard more distinctly; and I am confident, there will be found several other ways of improving them to greater perfection, since the improvement has been so considerable at first. I am,*

My Lord,

Your Lordships most obedient Servant,

FR. DIGBY.

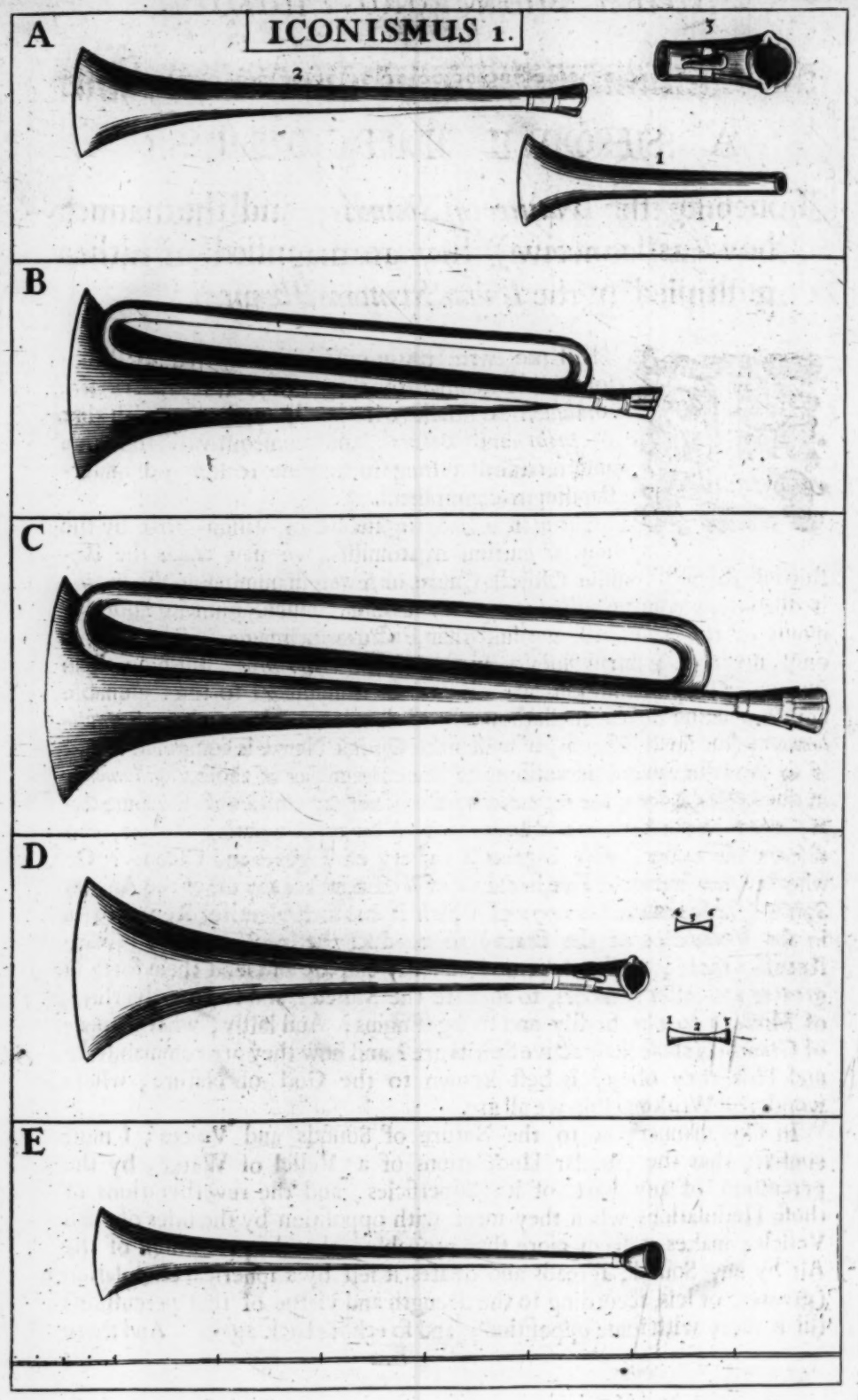
A SHORT DISCOURSE

Touching the *Nature of Sounds*, and the manner how (as I conceive) they are magnified, or rather multiplied by the *Tuba Stentoro-Phonica.*

I Shall not here engage my ſelf in any tedious Philoſophical Diſcourſe touching the Nature of *Sounds*, foraſmuch as I believe it equally myſterious with that of *Light* and *Colours*, and conſequently too fine and too ſubtil a thing for humane reaſon and underſtanding to comprehend.

True it is, as to the act of Viſion, that by the help of curious Anatomiſts, we may trace the Refracted Rays of viſible Objects (more or fewer in number as the *Pupilla* is dilated or contracted) through the ſeveral pellucid Tunicks and Humours of the Eye, till we find their Pictures or Images (their poſtures only inverted!) fairly lodg'd in the *Tunica Retiformis*. But how theſe Images or Repreſentations are afterwards tranſmitted to the reaſonable Soul? whether by the mediation only of that incredible number of *Capillamenta* (or ſmall Threds) of which the Optick Nerve is compoſed? and if ſo how the various percuſſions of the extremities of thoſe *Capillaments* in the *Tunica Retina*, are repeated by the other extremities of the ſame *Capillaments* in the Brain? and how the Soul by contemplating the one, can diſcern the other, with ſo great a variety of Figures and Colours? Or whether that immortal Fire, in the act of Viſion, makes any uſe of the Animal Spirits (thoſe nimble *Mercurys* of which it has ſuch plentiful Repoſitories in the Ventricles of the Brain) to conduct the ſpecies into its private Receſſes there, as ſhe does undoubtedly employ and ſend them forth in greater and leſſer numbers, to animate the Muſcles, and ſo give diverſities of Motions to our bodily and living Engins? And laſtly, what manner of Creatures thoſe little active Spirits are? and how they are commanded? and how they obey? is beſt known to the God of Nature, whoſe wonderful Workmanſhip we all are.

In like manner, as to the Nature of Sounds and Voices; I muſt confeſs, that the circular Undulations of a Veſſel of Water, by the percuſſion of any part of its Superficies, and the reverberations of thoſe Undulations when they meet with oppoſition by the ſides of ſuch Veſſels, makes it ſeem more than propable, that the percuſſions of the Air by any Sound, ſpreads and dilates it ſelf by a ſpherical Undulation (greater, or leſs, according to the ſtrength and virtue of that percuſſion) till it meet with ſome oppoſition, and ſo echoes back again. And there


ICONISMUS 1.
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is great reaſon to believe that Voices being firſt modulated and articulated by the *Glottis* of the *Larinx*, and the ſeveral parts of the Mouth, make ſpherical Undulations in the Air, till they meet with the Acouſtick Organ, whoſe excellent Fabrick we may indeed with admiration contemplate, and give a gueſs for what Uſes each part was ordained, namely the πτύγμα κατγγὸς, and πτύον ἀκουστικὸν, as likewiſe the *Tympanum*, together with the *Malleus*, *Incus*, and *Stapes*: But what manner of Images or Species ſuch Percuſſions make; with ſuch an infinity of diſtinctions and varieties? and how they fly about like Atoms in the Air? and are to be found in each point of the *Medium*? (and anon vaniſh into nothing?) and by what ſtupendious agility they are conveyed to the Soul? and how that does to receive ſo many millions of meſſages from without? and to diſpatch and ſend out as many more from within? and that in ſo ſhort a ſpace of time? the more we torment our thoughts about it, the leſs we underſtand it, and are forced to confeſs our Ignorance. Ἐν ᾗ τις ἀεὶ μᾶλλον μεριμνᾷ, ἧττον ἐν γνώσει ἐστὶ γινόμενος.

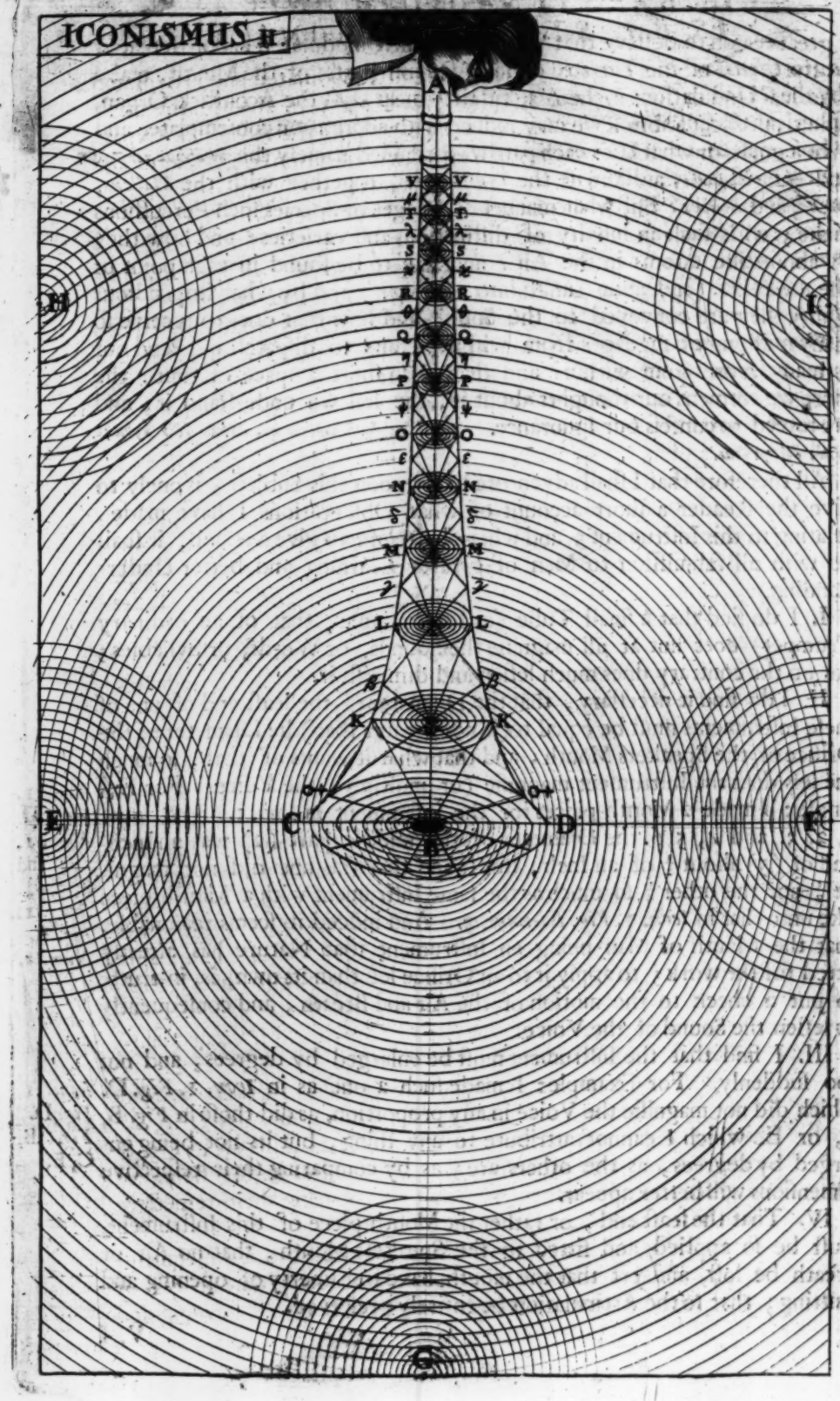
All therefore that I ſhall adventure to ſay upon this Subject; is onely to give the Reader a ſhort account of what Obſervations I have made, relating to this Inſtrument; and where I attempt to give a reaſon, it ſhall be with all ſubmiſſion to Men of greater Learning and better Underſtanding.

I. I do find that a ſmall Tube (as for example, that of an ordinary Trumpet) does not at all magnifie the Sounds, or Words, or Syllables; but on the contrary does much leſſen and diminiſh it.

II. I do find it neceſſary, that the Diameter of the leaſt end of one of theſe Inſtruments muſt be equal to (if not greater than) the Diameter of the Orifice of the Speakers Mouth; and that what it wants of that, ſo much the leſs does the Inſtrument magnifie (or multiply) the Voice. For Example: I made 2 Mouth-pieces for the Inſtrument in *Icon.* 1. *Fig. D. num.* 1, 2, 3. and 4, 5, 6. the Diameter of the middle part (2) was an Inch, and of (5) about $\frac{1}{2}$ of an Inch; but found that the one did not magnifie $\frac{1}{2}$ nor the other $\frac{1}{4}$ ſo much as the ſame Inſtrument with a Mouth-piece like unto that in *Icon.* 1. *Fig.* A. *num.* 3. And indeed it ſeems reaſonable, that the Mouth of Man being an Inſtrument that Nature has already fitted for the work; to apply it to an Orifice leſs than its own, is, in truth, to put a check to the motion of the Air and Breath, and conſequently to leſſen the Sound of the Voice. *Icon.* 1. *Fig.* D. *Num.* 1, 2, 3. and 4, 5, 6. *Icon.* 1. *Fig.* A. *Num.* 3.

III. I find that the Inſtrument muſt be enlarged by degrees, and not too ſuddenly. For Example: I made ſuch a one as in *Icon.* 1. *Fig.* D. which did not magnifie the Voice in any proportion, as did thoſe in *Fig.* B, C, or E. which I cannot attribute to any thing, but its not being enlarged by degrees, as the others are; as by comparing their reſpective dimenſions will better appear. *Icon.* 1. *Fig.* D. *Fig.* B, C, E.

IV. That the leaſt end, or rather the Mouth-piece of this Inſtrument, muſt be ſo applied and fitted to the Speakers Mouth, that no Air or Breath be loſt, and yet that the mouth have free liberty of opening and ſhutting, that ſo the Articulation be entirely preſerved.


ICONISMUS II.
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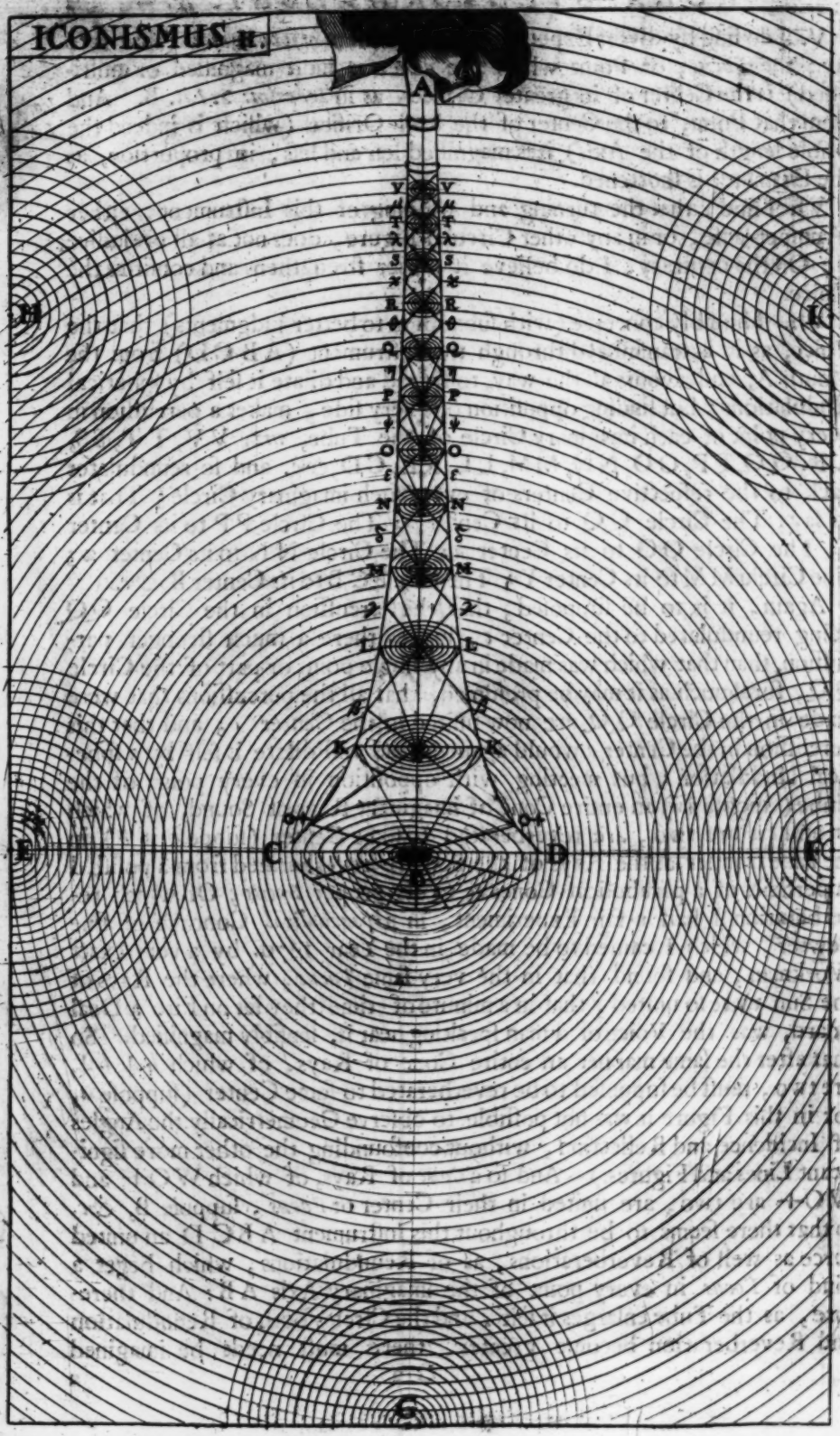
V. I do find by divers Experiments, that the *Polypus* (that is to ſay, the *Focus*, or Point where the Voice is moſt magnified or multiplied) is the Center of its greater Orifice, as in *Icon.* 2. *Lit.* B. and from that Point, to the Center of the leaſt Orifice (which is indeed the whole length of the Axis) it is magnified leſs and leſs, in proportion, as the Diameter is ſhortened. *Icon.* 2. *Lit.* B.

VI. I find, that the running and winding of this Inſtrument, either Trumpet-wiſe, or in any other Circular Figure, does not at all prejudice it: On the contrary, I do believe it rather ſtrengthens and confirms the Voice.

VII. I humbly conceive (with ſubmiſſion to better judgments) that the Voice, as it is tranſmitted through this Inſtrument (A B C D) from the Mouth A, endeavours all the way, to ſpread and dilate it ſelf by ſpherical Undulations; but finding oppoſition on every ſide, makes a percuſſion in every point of each imaginary Circle of the Tube, *viz.* V V, T T, S S, R R, Q Q, P P, O O, N N, M M, L L, K K, C D, *&c.* and ſo reundulates back to the reſpective Centers of every ſuch imaginary Circle; That is to ſay, The Circle Q Q to its Center *c*; The Circle P P to its Center *b*; The Circle O O to its Center *a*; The Circle N N to its Center *z*; The Circle M M to its Center Y; The Circle C B to its Center B, *&c.*

Again, it is to be ſuppoſed, that the Percuſſion in the Circle Q Q being reundulated to the Center *c*, makes there a much ſtronger percuſſion, than that which was made in any ſingle point or part of the Circle Q Q, foraſmuch as it may be preſumed, that all the percuſſions that were made in the Circle Q Q are now united in the Center *c*; and that this percuſſion in the Center *c* would again ſpread and dilate it ſelf by a ſpherical Undulation; but meeting with oppoſition in every point of the Tube (ſuppoſe *n n*) an entire Cone of imaginary Rays of Sound, of which *c n* and *c n* are two, are reverberated to ſome Center (ſuppoſe it *b*) in the ſame manner as the Rays of the Sun are reverberated from a poliſh'd Superficies of a parabolical Concave to its proper *Focus*; Of which reverberation I had a fair Experiment, in a *parabolical* Concave of fine Pewter, which I cauſed to be made in the Year 1670. by a very exact Workman, and found that in the very ſame *Focus*, where the Rays of the Sun were ſo united, that in a minute of time they ſet on Fire a Deal Board, was the Voice of a man ſpeaking near it, ſenſibly magnified. So that after the ſame manner an entire Cone of Rays, of which *b* ⊥, *b* ⊥, are two, muſt be ſuppoſed to be reverberated to ſome Center (ſuppoſe *a*, for in this Figure it was not poſſible to obſerve Geometrically the Angles of Incidence and Reflection, without confounding the other more ſignificant Lines and Figures.) And ſo a *Cone* of Rays, of which W O ⊢ and W O ⊢ are two, are united in their Center or *Focus*, ſuppoſe B, *&c.* ſo that there ſeems to be throughout this Inſtrument A B C D an united force as well of Reverberations, as of Reundulations, which beget a kind of *Focus* in every point of the imaginary Axis A B: And therefore, as the Tube enlarges it ſelf, and the Circles both of Reundulation and Reverberation become greater, there muſt needs be imagined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a greater number of reundulating Circles, and reverberating Rays to meet in each reſpective Center and *Focus*, whereby the ſame Voice is prodigiouſly magnified and augmented.

Wherefore if this Inſtrument A B C D were cut off in the points M M, it would not magnifie ⅓ of what it does at the whole length, which I have ſufficiently experimented, and am entirely ſatisfied therein.

And as to the points of Reundulation and Reverberation, my opinion was very much confirmed to me by a late Experiment I made with a Veſſel of Quickſilver, of the ſame Figure with this *Iconiſmus* H E G F I, in the midſt whereof was ſmall thin Hoops, or pieces of wood bent and fixed in the ſame Figure as is C K O V A V O K D, being cloſed at the end A, and open at the end C D. Into this Veſſel I put Quickſilver enough to cover the whole Figure, and conſequently the Figure A B C D. And then ſtriking the Quickſilver ſmartly in A with the end of a ſtick, it begot a numberleſs number of Curvilineal Undulating and Reundulating Figures, not unlike to the Figures V V, T T, S S, R R, *&c.* from the point A, to the point B, which were reverberated from the ſides A N C, and A N D, as they were driven along one by another.

This Experiment, together with another which I lately made, by carrying one Ear along the Line E F and W G, with what exactneſs I poſſibly could, whilſt a Gentleman did me the favour to read ſome pages of a Book, with an even tone, in each of the four Inſtruments B, C, D, and E, in *Iconiſm.* 1. ſeparately and diſtinctly: At which time I plainly found, that as my Ear advanced towards the point B, the Voice was ſenſibly magnified; but as it was removed towards W, it was ſomewhat abated; and as it was removed either towards C, D, or G, it was abated two, three, four, five, ſix, and more degrees; made me conclude for certain, that in every point of the imaginary Axis there is a *Focus* or *Polyphoniſmus*, but that the principal and chiefeſt *Focus* where the greateſt *Polyphoniſmus* of all is, that is to ſay, the point where the Voice is moſt of all magnified or multiplied, is B.

This *Focus* (or *Polyphoniſmus*) being now no longer impriſoned in the Tube, dilates it ſelf by ſpherical Undulations into the *Medium* (as in *Icon.* 2. may more plainly appear) till ſuch time as it meets with ſome oppoſition; as for Example, let us ſuppoſe it in the points H, E, G, F, I, from which points, and innumerable others, it is reundulated, multiplied, and reverberated throughout the Sphere of its activity: For by how much ſtronger the percuſſion is in B, ſo much greater is the Sphere of Undulation and Reverberation, and conſequently the Voice is heard at a greater diſtance.

And that ſuch Reundulations and Reverberations do exceedingly magnifie or multiply Sounds, I cannot but recommend to the Readers contemplation, a famous Experiment made in the Year of Our Lord 1615. by one *Bernardus Varenius* (a ſober and learned Writer) as he himſelf relates it in his *Geographia Generalis*, *Lib.* 1. *Prop.* 41. who, after he had with much pains and difficulty climb'd up to the top of *Carpathus*, a Mountain of *Hungary*, (whoſe perpendicular height he judged to be

a *German* Mile, and above all Winds and Motions of the Air) he discharged a Pistol, which made at first no greater noise, than if he had snapt a stick in sunder; till after some small space of time, being dilated, it waxed greater and stronger, and filled the Woods and Dales beneath. But descending through the annual Snows, towards the lower part of the Mountain, he discharged a second time, and the noise was so horrible, that it exceeded the Report of the greatest Cannon; insomuch that he feared lest the whole Mountain would have fallen with him. This noise lasted about ⅓ of an hour, till it had been multiplied and reverberated from the most abstruse Caverns of the Mountain, *&c.* as is better expressed in the Authors own words, *Explosi in ea summitate sclopetum, quod non majorem sonitum primo præ se tulit, quam si ligillum vel bacillum confregissem, post intervallum autem temporis murmur prolixum invaluit, &c.*

Varen. Geograph. Gen. l. 1. prop. 41.

So that from this Experiment of *Varenius*, we are to conclude with him, That the percussion of the Air made by the first discharging of his Pistol on the utmost top and sharpest point of the Mountain, being dilated by a spherical Undulation, and meeting with no Objects to reundulate it, was at the first scarcely heard by him who discharged it; whereas the second Report, being nearer to the Caverns and Woods beneath, were suddenly and prodigiously multiplied and reverberated.

VIII. But in the last place, as to the demonstrative part of this *Tuba Stentoro-Phonica*, together with the exact Figure and Dimensions of it, That is to say,

> **"What is that Right-lined, Curvy-lineal, or mixt "Figure? And what are its exact Dimensions? "And what the Sphere of its Activity? That "best and most magnifies Humane Voyce in "Syllables, Words, and Sentences?**

is a new *Problem*, which I humbly propose to the learned Philosophers and Criticks of this our Age, as a thing that merits their Studies and Contemplations, hoping that some one or other of them, either at his own, or his Princes charge, may happily find a way how it may be clearly solved and demonstrated, whereby the Invention may come to be of greater use and benefit to Mankind, than from this first Adventure of mine could reasonably be expected.

——*Et erit mihi magnus Apollo.*

A Brief Account of the Manifold USES OF THIS *TUBA STENTORO-PHONICA,* OR LOUD SPEAKING-TRUMPET, Both at SEA, and LAND.

I. *At Sea.*

I. IN a Storm, or in a dark night, when two Ships dare not come ſo near one to the other as to be heard by any mans ordinary Voice; I conceive it may be of great uſe, that by this Inſtrument they may with great facility ſpeak and diſcourſe together at half a mile or a miles diſtance, or more, if occaſion require, eſpecially if alternately they take the advantage of the Wind. And if that be ſo ſtrong, that but one of the Ships can have any opportunity of ſpeaking with the Wind, the other may anſwer by ſigns, though directly againſt it.

II. In a Storm, it is of great uſe in a ſingle Ship, that one mans Voice giving Orders for governing and ſteering the Veſſel, may be heard diſtinctly by all the Mariners. Of which His Majeſty, who perfectly underſtands all Maritime Affairs, is ſo ſenſible, that He has already given order for ſome of theſe Inſtruments of the ſmaller ſize (as judging them moſt uſeful) to be made and put into ſeveral of His Royal Ships. And it is to be believed, that when the uſe of them ſhall be more publickly known, few Ships (whether Men of War or Merchant-men) will go to Sea without them.

III. In Calm weather, an Admiral may give Orders to his whole Fleet, though they lay two or three miles about, without ſending out Boats and Meſſengers from Ship to Ship.

IV. In caſes of great Expedition, Orders may be given from ſuch Forts as the Caſtle of *Deal, &c.* to any one or all the Ships riding in the Road. And if it be a matter of ſecrecy, it may be ſpoken in Cypher, being before hand agreed on between the Governour of ſuch a Caſtle, and the Admiral or chief Commander aboard thoſe Ships.

II. *At Land.*

I. IN caſe a Town or City be Beſieged, and ſo cloſe girt about, that there can be no meſſage ſent in; by this Inſtrument at one, two, or three miles diſtance, they may be told that there is Relief coming, and what number, and when they are to expect them, and how they are to behave themſelves upon their approach; and this by ſpeaking in

Cypher, as is before mentioned. And so on the contrary, may the Besiegers make as good use of this Instrument to threaten and discourage the Besieged, not only the Officers and Souldiers on the Walls and Bulwarks, but all the People and Inhabitants, how great and spacious soever the Town or City be.

II. A General may himself speak to his whole Army, though forty or fifty thousand men or more, either to give Orders to his Commanders and Officers, or to encourage and put life into his common Souldiers.

III. Whereas now a Herald at Arms making a Proclamation, though of never so great concernment and importance, can scarcely be heard by above thirty or forty Standers-by; by the help of this Instrument he may be heard very distinctly by many thousands. And the Case is almost the same in such Courts of Judicature as the *Kings-Bench* in *Westminster-Hall*, *&c.* where many of His Majesties Subjects are punisht for not hearing the Call of the Common Cryer, further, and beyond the sphere of activity of the said Cryer's speaking Organ.

IV. An Overseer of Works, of what kind soever, may by this give Order to many hundreds of Workmen, without once removing his station.

V. In case of great Fires, where usually all people are in a hurry, the Officers and Commanders may by this Instrument so govern the Assistants, as to prevent disorder and confusion, and consequently may save a Town or City from perishing.

VI. In case a number of Thieves and Robbers attaque a House that is lonely, and far from Neighbours, by such an Istrument as this, may all the Dwellers round about, within the compass of a Mile or more, be immediately informed, upon whose House such an attaque is made; the number of Thieves or Robbers, how armed and equipped, what manner of persons, with the colour and fashion of their Habits, and by what way they have made their escape, with any such like circumstances; whereby they would certainly know, with what strength to come upon those House-breakers, where readily to find them, or which way to pursue them. No particular whereof can be performed by either Drum, Trumpet, Bell, or any other Engin or Instrument, hitherto in use.

These and many more may be the Advantages of this New Instrument, as it is already invented: And I do not doubt, but were the Dimensions of the *Fig.* C. in *Icon.* I. sufficiently enlarged, it might render a Voice audible at the least eight or ten Miles, either at Sea or Land, with a favourable Wind. And what further additions to, and improvements of this Invention may hereafter, by the Art and Industry of Ingenious and Learned Men, be found out, Time and Experience will better shew. In the mean time, if the World shall kindly accept these my first Endeavours, it will be an Encouragement to me hereafter to produce others.

SOLI DEO GLORIA.

FINIS.